

What we claim is:

1. In a wireless communication system having at least one repeater and a geolocation system for determining the location of a mobile by measuring an attribute of the mobile's uplink signal, a method of determining if the uplink signal is received directly or via the at least one repeater, comprising:

estimating the location of the mobile appliance by the geolocation system;

determining an accuracy of the estimate;

determining if a Timing Advance (TA) of the uplink signal can be associated with the Equivalent Propagation Distance (EPD) of the at least one repeater;

determining which receivers have received the uplink signal;

determining which transmitters are received by the mobile appliance;

determining the relationship between the power of the received signals and the power at which the mobile transmitted the uplink signal;

determining at least one figure of merit based on the accuracy of the estimate, the TA of the uplink signal, the equivalent propagation distance, the receivers receiving the uplink signal, the transmitters received by the mobile appliance, the power of the received signal and the power at which the mobile transmitted the uplink signal; and,

comparing the at least one figure of merit to at least one or more threshold values to determine whether the uplink signal is received directly or from the at least one repeater.

2. The method of Claim 1, comprising quantifying the accuracy of the estimate; the association of the TA and the EPD; the receivers receiving the uplink signal; the transmitters received by the mobile appliance and the relationship of the received power and the transmitted power to the TA.

3. The method of Claim 2, wherein the step of determining at least one figure of merit is based on the quantifications.

4. The method of Claim 3, wherein the quantification of the accuracy of the estimate is d1, the quantification of the association of the TA and the EPD is d2, the quantification of the receivers receiving the uplink signal is d3, the quantification of the transmitters received by the mobile is d4 and the quantification of the relationship of the received power and the transmitted power to the TA is d5; and,

wherein the figure of merit is a function of d1, d2, d3, d4, and d5.

5. The method of Claim 4, wherein the figure of merit is $M = \sqrt[3]{d_1 d_2 d_3 d_4 d_5}$.

6. The method of Claim 1, further comprising selecting the location of the repeater if the uplink signal is determined to be from the repeater as the location of the mobile.

7. The method of Claim 1, further comprising selecting the estimate of the location if the uplink signal is determined to be directly from the mobile as the location of the mobile.

8. In a wireless communication system having one or more repeaters and a geolocation system which determines the location of a mobile by measuring an attribute of the mobile appliance's received uplink signal, a method of determining if the uplink signal is

received directly or via one of the one or more repeaters comprising: determining a timing advance of the received uplink signal and comparing the timing advance with a known equivalent propagation distance associated with each of the one or more repeaters and determining whether the uplink signal is received directly or via one of the one or more repeaters based on the comparison.

9. The method of Claim 8, wherein the equivalent propagation distance is a function of the distance between the one or more repeaters and a receiver, the delay of the one or more repeaters and a timing advance resolution.

10 The method of Claim 9, wherein the delays of the repeaters are fixed.

11 The method of Claim 9, wherein the delay of the repeaters are selectable.

12. In a wireless communication system having one or more repeaters and a geolocation system which determines the location of a mobile by measuring an attribute of the mobile appliance's uplink signal, a method of determining if the uplink signal is received directly or via one of the one or more repeaters comprising: determining the probability for each of two hypothesis and choosing the hypothesis with the greatest probability, wherein the probabilities for each of the two hypothesis are based on a timing advance of the transmitted uplink signal, hearability of the transmitted uplink signal and known locations and delays of the one or more repeaters.

13. The method of Claim 12, wherein the probabilities for each of the two hypotheses are determined at least in part by one or more factors chosen from the group comprising,

the TA parameter of the uplink signal transmitted by the mobile appliance;

the number of receivers receiving the uplink signal;

the power level of the transmitting mobile appliance and the power level of the received uplink signal;

the estimated location of the mobile appliance from the geolocation system;

the mobiles reception of neighboring cells; and,

the locations and applied delays for the one or more repeaters.

14. The method of Claim 12, wherein the uplink signal being received directly from the mobile appliance is one of the two hypotheses

15. The method of Claim 12, wherein the uplink signal being received from the one or more repeaters is one of the two hypotheses.

16. The method of Claim 12, wherein determining the probability comprises at least in part characterizing the reception of the mobile appliance's uplink signal throughout the wireless communication system.

17. In a network overlay geo-location system for locating a mobile appliance in a host wireless communication system where the host wireless communication system has a plurality of base stations and one or more repeater stations, a method of determining whether a signal transmitted by a mobile appliance is received at one of the base stations directly or via the one or more repeater stations, comprising:

determining the approximate distance between the base station and the mobile appliance based on the TA of the mobile appliances transmitted signal,

determining a touch stone equivalent distance,

comparing the equivalent distance with the approximate distance and,

determining if the signal is received directly or through a repeater based in part on the comparison.

18. The method of Claim 17, wherein the equivalent touch stone distance comprises the propagation distance between the repeater and the base station, the repeater delay and the timing advance resolution.

19. In a wireless communication system having at least one repeater, a method of determining if an uplink signal is received directly from a mobile or via the at least one repeater comprising;

determining one or more factors selected from the group of:

a relationship between a TA of the uplink signal with the equivalent propagation distance of the at least one repeater,

receivers that have received the uplink signal,

transmitters received by the mobile appliance, and,

a second relationship between the power of the received signal, the power at which the mobile transmitted the uplink signal and the TA;

determining at least one figure of merit based on the one or more factors selected; and,

comparing the at least one figure of merit to at least one or more threshold values to determine whether the uplink signal is received directly or from the at least one repeater.

20. The method of Claim 19, wherein the one or more factors are quantized.

21. The method of Claim 20, wherein the one or more factors are quantized as d1, d2, d3, and d4 respectively.

22. The method of Claim 21, wherein the at least one figure of merit is
$$M = \sqrt[4]{d_1 d_2 d_3 d_4}.$$

23. The method of Claim 19, wherein the step of determining one or more factors includes selecting two or more factors.

24. The method of Claim 19, wherein the step of determining one or more factors includes selecting three or more factors.

25. The method of Claim 19, wherein the step of determining one or more factors includes selecting all of the factors.

26. The method of Claim 19, further comprising determining an estimated location of the mobile using a geolocation system, determining the accuracy of the estimated location and determining whether the uplink signal is received directly or from the at least one repeater at least in part by the accuracy of the estimated location.

27. In a wireless communication system having at least one repeater, a method of determining if an uplink signal from a mobile is not operated on by the at least one repeater comprising;

retrieving a timing advance value of the uplink signal;

comparing the timing advance value to a known equivalent propagation distance of the at least one repeater;

determining if the uplink signal is not received from the at least one repeater based on the comparison.

28. The method of Claim 27, wherein the known equivalent propagation distance is a function of the distance between the at least one repeater and a receiver and the time delay associated with the at least one repeater function.

29. The method of Claim 28, wherein the comparison is at least in part a function of the resolution of the TA.

30. The method of Claim 28, wherein the radius of the area served by the at least one repeater is much less than the distance between the at least one repeater and the receiver.